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U. S. DEPARTMENT OF AGRICULTURE.

REPORT

OF THE

Chief of the Division of Biological Survey

FOR

1905.

BY

C. HART MERRIAM.

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REPORT OF THE CHIEF OF THE DIVISION OF BIOLOGICAL SURVEY.

U. S. Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., August 1, 1905.

Sir: I have the honor to submit herewith a report of the work of the Biological Survey for the fiscal year ending June 30, 1905, with outline of work for 1906, and recommendations for 1907.

Respectfully,

C. Hart Merriam, *Chief.*

Hon. James Wilson, *Secretary.*

WORK OF THE YEAR.

The work of the Biological Survey is prosecuted along the lines laid down by Congress, as follows: (1) Investigations relating to the geographic distribution of animals and plants, including biological surveys and the determination of the life and crop belts, in charge of the Chief; (2) investigations of the economic relations of birds to agriculture, in charge of Prof. F. E. L. Beal; (3) investigations of the economic relations of mammals to agriculture, in charge of Prof. D. E. Lantz; (4) supervision of matters relating to game preservation and protection and the importation of foreign birds and animals, in charge of Dr. T. S. Palmer.

GEOGRAPHIC DISTRIBUTION.

Perhaps no part of the work intrusted to the Biological Survey is of more importance to the practical progressive farmer than the mapping of the natural life zones of the country, closely correlated as they have been found to be with the crop zones. When these are fully laid down for the entire country, as they have been already for portions of it, the farmer will have a ready, practical guide to the crops most likely to be successful in any given locality and will be saved many costly experiments. During the current year considerable progress has been made in studying the birds, mammals, and woody plants of different regions and in collecting data bearing on their geographic distribution. This primary field work by means of which the life zones are located has been carried on in California, Texas, New Mexico, Colorado, and Alaska. The transfer of the data so gathered to maps showing the distribution of each species, and

finally to maps showing the entire extent of the country included in each life zone, constitutes an important part of office work, and material progress is being made in it.

Field work in Texas, in charge of Vernon Bailey, chief field naturalist, has been completed, and the work is now being continued in New Mexico and Colorado. Investigations during the current year were conducted in the Taos, San Juan, and Gallinas mountains, in northern and northwestern New Mexico, and in the Antonito and Del Norte country in Colorado. A report on the Texas work has just been completed by Mr. Bailey, and is now in the printer's hands. This treats in detail of the life zones of the State and of its mammals and reptiles, with especial reference to their economic relations.

A report is being prepared by H. C. Oberholser on the birds of Texas, which it is hoped will be completed during the coming year, when we shall possess a very complete knowledge of the natural history of this large and important State, so far as connected with the particular field covered by the Survey.

The biological exploration of the Mackenzie basin, including Great Slave Lake and a part of the barren ground near Great Bear Lake, was concluded in the early part of the present fiscal year.

E. A. Preble, the assistant in charge of this work, wintered at Fort Simpson, on the Upper Mackenzie, for the purpose of studying the conditions of an arctic winter and of being on the ground so as to begin investigations in the early spring. Having finished work at Fort Simpson, he descended the Mackenzie in June, visited Fort MacPherson, on the Lower Peel River, making collections here and at other points on his way southward. The results of the work in this far northern region are of great interest and importance, as they bear directly upon the distribution of many northern types of animal life which enter Alaska and our Northern States, and concerning which previous knowledge has been deficient. Mr. Preble is now engaged in mapping the results of his work and in preparing a report.

Explorations were carried on in the northern Rocky Mountains of the Yukon territory in regions adjacent to and faunally related to Alaska. This work was in charge of Wilfred H. Osgood and was necessary to complete work already undertaken in Alaska. By the cooperation of Charles Sheldon, of New York, who generously defrayed expenses, the party was enabled to visit regions hitherto inaccessible. Two trips were made, one into the Ogilvie Range near the Alaska boundary, the other to the region about the head of the Macmillan River, thus touching the main Rocky Mountains at two widely separated points. The lack of information from these regions has been a serious obstacle to a knowledge of the distribution and relationships of the mammals and birds of Alaska. Reports on the results of this work are now being prepared.

ECONOMIC ORNITHOLOGY.

As in previous years the work on the food habits of birds has been carried on simultaneously in the field and laboratory. The study of birds in their relation to agriculture is assuming more and more importance as increased areas are devoted to crop raising, thus changing natural conditions and disturbing the balance of nature. The

destruction of mammals and birds of prey that live upon noxious rodents, the slaughter of game and other birds whose natural food consists of injurious insects, the extermination of snakes, and the deforestation of extensive tracts all tend to disturb the harmonious adjustment of nature, and result in the unnatural increase of certain insects, such as the cotton boll weevil, to the embarrassment and serious loss of the farmer. The field study of birds, especially of their food habits, and the examination of the contents of their stomachs to ascertain accurately the nature of the services they render are hence of great and growing importance. Comparatively little field work has been undertaken by this section during the year, as the demand for reports upon material already in hand has taxed the efforts of the available assistants. Work upon the stomachs of birds collected in the fruit-growing regions of California has been pushed as rapidly as possible, but owing to their large number much still remains to be done. The collection of bird stomachs from California, in no small part due to active cooperation of fruit growers and ornithologists of the State, is greater than that from any other equal area in the country. This material has involved an unexpected amount of work, but so satisfactory is it that the resulting report will be comprehensive and final. More than 6,000 stomachs from that State have been already examined and several thousand more are awaiting examination.

The legislatures of several States have taken much interest in the food of wild ducks as related to their migrations and to the fixing of a proper open season. In order to furnish information upon this subject, an assistant, W. L. McAtee, has spent several months in studying the food of ducks and geese, of which more than 400 stomachs have been examined. Efforts are being made to procure as many more as possible so that a full report on the food habits of these important birds may be published at an early date.

Investigations of the food habits of the remaining game birds of the United States have been carried on during the year, and were approaching completion when interrupted by the unfortunate illness of Doctor Judd, assistant in charge of the work.

The ravages of the cotton boll weevil in Texas for several years past have been serious, and much thought and attention are being given to methods of combating the pest. In this work it is believed that birds may prove a competent ally, and it is important that a thorough investigation be made of the food habits of the species inhabiting the infested region. This is now being done and will be continued until definite results have been obtained. It has been already ascertained that several species prey upon the boll weevil, and it is important to learn to what extent this insect constitutes an element of their fare. It is believed that other birds that do not now feed upon the weevil will in time learn to do so. The beetle is a recent visitant to the region in question, and birds do not at once acquire a taste for new food or immediately learn the habits of new insects so as to effectively attack them. Hence an insect new to a region may at first enjoy almost complete immunity from the resident birds, and later may become a favorite food of several species.

For some years the food habits of the horned larks have been under investigation. These birds are widely dispersed in the United States, and in some sections have been accused of doing considerable damage

to grain. A sufficient number of specimens was collected in various parts of the country to permit of a thorough examination, and as a result the horned larks as a group have been ascertained to be decidedly beneficial in most of the country they inhabit, owing to their destruction of noxious insects and weed seeds. In certain sections, however, particularly in California, the bird does damage to seed grain, but this may be easily prevented. A bulletin containing the essential facts of the above investigation has been prepared by W. L. McAtee, and will soon be issued.

A similar investigation is being made of the economic relations of another widely distributed group of birds, the grosbeaks, one or more species of which occur in every part of the United States. Much economic interest attaches to the grosbeaks, as certain of them are reputed to destroy fruit and grain, while two species are known to be good friends of the farmer—the rose-breasted grosbeak showing a decided taste for the Colorado potato beetle, and the black-headed grosbeak of the West feeding largely upon the black olive scale, one of the most destructive insects of the Pacific coast fruit region.

A bulletin on the economic relations of the grosbreaks will probably be ready for publication within the year.

For many years the Biological Survey has received inquiries relative to the trees, shrubs, and other plants that may be cultivated about our homes and orchards for the purpose of furnishing suitable summer and winter food for birds, with a view to increasing their numbers and diverting them from cultivated fruits. It is thought that similar methods may be effective in attracting game birds to depleted preserves. Investigation shows that many plants are suitable for the above purposes, among them not a few that are highly ornamental. It is intended at an early day to issue a bulletin upon this important phase of bird food and protection.

BIRD MIGRATION.

During the year the usual spring and fall migration schedules were sent to and received from the regular observers and filed for future use. In order to round out our knowledge of the migratory movements of our birds special attention has been given to the occurrence of United States birds south of our boundary, and the original records have been searched for such occurrences in the West Indies, Central America, and South America.

Similarly the migration records from Canada have been copied; also the notes received from the Western States (Texas to Montana and westward).

The work in hand at the present time is a bulletin on the "Distribution and migration of North American ducks and geese."

ECONOMIC MAMMALOGY.

A new assistant, Prof. D. E. Lantz, has been put in charge of the investigation of the economic relations of mammals to agriculture. It is well known that in many parts of the country the yearly damage to stock and to crops resulting from the attacks of mammals is great. In many sections the sheep industry is rendered impossible, because unprofitable, owing to depredations of coyotes and the larger wolves,

while in many others the profits resulting from this industry are much reduced. During the year experiments have been made in Kansas and Oklahoma with a view to testing the practicability of fencing out coyotes from sheep, and of finding a cheap and effective fence. The fencing method, though somewhat expensive in first cost, is believed to promise well, since it is likely not only to completely protect the sheep, but also to improve the pasturage. Moreover, it enables the services of herders to be dispensed with, and hence in the end may prove to be relatively economical. A bulletin on the subject by Professor Lantz has been published; and to give the matter wider currency it has been issued also as a Farmers' Bulletin.

The number of small rodents—rats, mice, and similar mammals—that attack grain, grass, alfalfa, and tubers is surprisingly large, and they exist everywhere throughout the country, occasionally multiplying beyond all bounds. Daily inquiries are received by the Survey asking for instructions as to the best and cheapest method of ridding the farm, the orchard, and the nursery of these pests. As the result of previous investigations more or less practicable methods of controlling the rodents by means of traps, poisons, and other agents have been discovered, and the subject is being further studied with a view to devising still cheaper and more effective methods.

Rabbits have always proved difficult animals for farmers to cope with, and frequently they cause serious damage to nursery stock and other crops. It often happens that after a term of years, during which comparatively little injury is suffered from these animals, their numbers suddenly increase enormously, and the resulting damage is correspondingly great.

Attempts to poison rabbits have sometimes proved highly successful, and renewed experiments are being made to discover a cheap and effective method that may be generally available for the destruction of these pests. In Australia various forms of wire fence have been tried with considerable success, and experiments in this direction will be made in localities in the West where rabbits are most numerous and troublesome.

Prairie dogs and the larger ground squirrels are a perennial source of annoyance in many of the States of the far West, and in places successful agriculture is all but impossible because of their depredations, especially in the Dakotas, Oregon, and Washington. Past experiments have demonstrated that by means of poisoned food and of gases introduced into their burrows the animals may be destroyed. By concerted action on the part of ranch holders there is little doubt that in some sections at least the complete extermination of these mammals might be accomplished. Upon farmers of small means, however, the expense of such work falls heavily and threatens to absorb all possible profits. Renewed study of the problem is now being made by field assistants with the hope of discovering cheaper methods.

GAME PROTECTION.

The conditions relating to game are constantly changing, and the simple and inadequate methods of protection of a few decades ago have been replaced by a complex system of laws requiring for their enforcement the services of special State officials. Every effort has

been made to secure the adoption of modern methods for the protection of game, to meet the numerous demands for aid and information concerning game laws and methods of enforcement, and to cooperate in every way possible with the several States and the various game-protective associations. The work of the year has been conducted on five distinct lines: (1) Supervision of the importation of foreign birds and mammals; (2) cooperation in restricting interstate shipments of game contrary to law; (3) supervision of bird reservations; (4) protection of game in Alaska; and (5) collection and publication of matter relating to game protection.

IMPORTATION OF FOREIGN MAMMALS AND BIRDS.

During the year 390 permits were issued for the importation of 200 mammals, 250,000 canaries, and 37,000 miscellaneous birds, and 5 for the entry of 2,270 eggs of pheasants, a considerable increase in number as compared with last year.

Practically all of the cage birds and many of the game birds were imported through New York, and 95 consignments, embracing all but a small proportion of the total number, were inspected by the Department inspectors there. Besides these entries there were imported 300 mammals, 3,350 canaries, 12,000 miscellaneous birds, and 200 reptiles (chiefly turtles and snakes) which did not require the issue of permits.

Most of the birds brought in were cage birds, but a large number of game birds were imported for aviaries and a few for stocking covers. These included 1,000 pheasants, 300 quail, 450 partridges, 300 ducks, and 600 miscellaneous game birds. Twenty thousand pigeons and doves were imported, chiefly domesticated species for breeding purposes.

No injurious species have been reported for entry, and, so far as is known, no attempt has been made to introduce any into the country surreptitiously.

Capercailzie.—The game birds imported include more than 100 capercailzie destined for liberation on Grand Island, Mich. The capercailzie is found in northern Europe, and is the largest member of the grouse family, full-grown males weighing 10 to 12 pounds. The bird is nonmigratory, is extremely hardy, and its flesh is excellent. The results of its introduction into Michigan will be carefully watched. A number brought from Sweden and liberated in Algonquin Park, Ontario, last year, as mentioned in the report of the Biological Survey for 1904, have wintered successfully and appear to be thriving.

Partridge eggs.—Investigation of the importation of partridge eggs for stocking purposes, mentioned in the report for 1904, developed the fact that less than 50 per cent hatched. Further inquiry showed the probable cause of this partial failure to be largely injury from the long ocean voyage, and partly the inferior quality of the eggs imported. The second cause particularly attaches to Hungarian partridge eggs, which are said to be carelessly collected by peasants, and subsequently negligently handled by dealers. In the present condition of the trade and facilities for transportation it is doubtful if this method of introducing partridges will justify the expense involved.

INTERSTATE COMMERCE IN GAME.

The number of cases of illegal shipments of game from one State to another is considerably larger than the previous year. The records of 1904–5 show 23 cases involving the shipment of 1,608 birds and 52 rabbits, as against 10 cases involving the shipment of 700 birds and 36 rabbits in 1903–4. Eleven convictions and several indictments were secured during the year, making a total of 53 convictions in cases passing through the Department since the passage of the Lacey Act in 1900. Of these, 5 were secured in Federal courts and 6 in State courts.

Special mention should be made of the cooperation in this work of the State authorities of Illinois, Iowa, North Carolina, Nebraska, and Minnesota. As in former years, a number of cases in Iowa have been prosecuted in the State courts by the warden, who secured in one instance a fine of $400 on account of the shipment of 248 birds.

Field work.—Examination was continued of the extent and character of illegal shipments of game and of the methods used by State officials to suppress it in Illinois, Iowa, Missouri, Nebraska, and Wisconsin. Personal inspection was made of the conditions prevailing in these States, and North Carolina also was visited with the same object. Particular attention was given to illegal transportation of game at St. Louis, which, from its geographic position, offers special opportunities for violations of the nonexport laws. Examination of the methods of freight traffic led to the belief that game was carried by hand or by wagon across a certain bridge to East St. Louis and there reshipped. A number of deputy wardens were detailed by the game commissioner of Illinois to watch this bridge, and arrests immediately followed. Eight cases have thus far been presented to the courts, in one of which a penalty of $200 and costs was imposed.

Wild fowl protection in Texas.—Wherever possible, organizations and individuals have been aided in attempts to establish or maintain adequate protection of game. Mention may be made of the results attained in Texas, where a strong effort was begun to nullify the law enacted in 1903, prohibiting export of waterfowl from that State. This law was an important step in the preservation of wild ducks, and it is gratifying to be able to report the success of the effort to maintain and enforce it.

Thanksgiving game.—As last year, an investigation was made of the amount of game on the market and the prevalent prices therefor immediately preceding Thanksgiving Day. The detailed results of the investigations of the two years will be published shortly. A growing scarcity of game in the markets is indicated, mainly due to the increase of restrictive laws and more effective enforcement. Venison was entirely absent from the markets west of the Mississippi, and was scarce at several eastern points. Prairie chickens were scarce everywhere, especially in 1904. Quail were scarcer in 1904 than in 1903 in every place except St. Louis, where they glutted the market, probably from an oversupply to meet the demands caused by the Exposition.

With a growing scarcity of native game there is a tendency to supply the market with imported game, mainly different species of

grouse. Prices for these foreign supplies were not noticeably high, while from 1903 to 1904 the prices of native game showed a tendency to rise.

RESERVATIONS.

Pelican Island Reservation.—As a result of protection afforded the birds on Pelican Island, in Indian River, Florida, the colony is thriving. On November 23, 1904, pelicans were reported by the warden to be more numerous than ever before at that date. The nesting season extended from the middle of November, 1904, to the 1st of May, 1905. The birds returned this season to the main island, arriving in numbers about November 1 and beginning to lay on November 18. Young birds made their appearance a month later and by January 3 were numerous.

Breton Island Reservation.—Three islands, known as Breton, Old Harbor, and Freemason islands, lying off the coast of Louisiana just north of the Delta of the Mississippi River, for years have been frequented by thousands of ducks, gulls, terns, pelicans, man-o'-war birds, and shore birds, the ducks wintering, the others breeding. Owing to plans for the practical extermination of the ducks by market hunters during the winter, an Executive order was issued by the President on October 4, 1904, making the group of islands a bird reservation, to be known as the "Breton Island Reservation," and placing them under the supervision of the Department of Agriculture. A warden was appointed, to be maintained, like the warden of the Pelican Island Reservation, by the cooperation of the Department and the National Association of Audubon Societies, and trespass warnings were posted on the islands. The ducks, which have wintered in their usual immense numbers, have not been molested, so far as is known. The warden reports that mallards, baldpates, pintails, and redheads begin to leave the reservation February 1 and all are gone by February 20, while with black ducks the period of departure is April 10 to 20.

Stump Lake Reservation.—A third reservation, the Stump Lake Reservation, was created by the President on March 9, 1905. Thousands of ducks and other waterfowl breed on four small islands in Stump Lake, near the center of North Dakota, the total area of which is 27.39 acres. In order to afford adequate protection to the birds during the nesting season an Executive order was issued placing the islands on the same footing as the Pelican Island and Breton Island reservations.

Wichita Game Refuge.—On January 24, 1905, Congress passed an act authorizing the President "to designate such areas in the Wichita Forest Reserve as should, in his opinion, be set aside for the protection of game animals and birds and be recognized as a breeding place therefor," and prohibiting hunting, trapping, killing, or capturing all game animals and birds within such areas, except under such regulations as the Secretary of Agriculture should prescribe. Pursuant to the authority conferred by this act, the President on June 2, 1905, issued a proclamation announcing the establishment of this national game refuge. Upon this tract, which is in the Wichita Mountains, Oklahoma, quail are especially abundant, and the principal value of the measure will probably consist in affording a breeding ground for these birds.

PROTECTION OF GAME IN ALASKA.

The most important feature of the protection of Alaska game—the regulation of export—has been fully maintained throughout the year, and there appears to have been no resumption of the trade in skins and trophies. The bill introduced into the last Congress, in which radical modifications in the present system were made, failed to become a law. While it was pending, the issue of permits for shipment of trophies was suspended. Hence the number of such permits granted during the year is comparatively small. New regulations were issued in June limiting shipment of trophies to (1) residents of Alaska and (2) persons desiring to export trophies secured prior to 1905. The total number of export permits issued during the year was 10 for specimens, and 12 for trophies. Six shipments reached Seattle without permit. One, consisting of a deer head which arrived in bad condition, was destroyed by direction of the customs officials at Seattle; and two—two caribou heads from Nome and 400 pounds of ivory—owing to special circumstances, were released.

TRANSFER OF ELK.

As stated in the annual report of last year, the preparations for transporting the elk, offered to the Department by Miller and Lux, from Kern County, Cal., to Kaweah Park were completed. Owing to unforeseen difficulties and delays, the attempt to corral the animals was not made till November 12. The animals, however, proved to be so intractable that the effort to drive them into a corral had to be abandoned and several were roped. As a result of their excessive exertion and the rough usage to which they were necessarily subjected only two reached Kaweah Park alive. Owing to this experience another method has been devised, and Miller and Lux have promised to secure a sufficient number of young and yearlings to insure the success of the experiment.

SPECIAL INVESTIGATIONS.

The following subjects have received special consideration during the year, namely: Hunting licenses, migration and protection of shore birds, State organizations for the enforcement of game laws, recommendations of State game officials, and the care of birds in winter.

Hunting licenses.—The widespread interest in hunting licenses and the growing popularity of this method of raising funds for game protection made it desirable to collect statistics regarding their history, objects, and limitations. These were published as Bulletin 19 of this Division. Since the publication of this report five States have established nonresident licenses for the first time, four resident licenses, and four alien licenses.

Shore birds.—Investigation of the migration of shore birds and the laws protecting them has been continued, and has been extended to include special features connected with the protection of migratory game birds. A report of results will soon be ready for publication.

Game commissions.—Much progress has been made in the work of ascertaining the organization of game commissions and the methods of enforcing game laws. The results will appear shortly as a bulle-

tin and will include the laws passed in 1905. This bulletin will constitute the third part of the game law series published by the Survey.

Wardens' recommendations.—In the belief that the compilation of the recommendations of State officers charged with the enforcement of game laws would be valuable for comparison with bills introduced or passed, and for indicating the general trend of game protection, such a work was completed during the year, appearing as Circular No. 47.

Feeding birds.—The severe winters of the past two or three years have caused so great mortality among birds that the practice of putting out food for both game and nongame birds has become common. With a view to organizing and systematizing methods, a study of the subject has been made which will be published as a circular.

INFORMATION CONCERNING GAME.

Bibliography.—The importance of a means of ready reference to game-protection literature has long been apparent, and during the year work was begun on the preparation of a bibliography of the general literature of the subject and of an index of the game laws of the United States from the earliest colonial times to date.

Mention was made in the last report of the need of a bibliography to afford ready reference to the miscellaneous mass of special treatises, discussions, papers, and informal notes, many of which are valuable by way of indicating precedent and procedure. Fair progress has been made in the preparation of this.

Index of game laws.—This work was undertaken in cooperation with and at the request of the New York State Library at Albany, N. Y., which has in course of preparation a comprehensive index of legislation. Many laws have been carded, and a complete index has been made of those of Florida and West Virginia and of the early laws of New York (covering the period from 1777 to 1820). The numerous local laws of North Carolina, also, for the past twenty years have been indexed.

ROUTINE WORK.

Year by year the routine work of the Survey increases. This consists of correspondence, accounts of expenditures, preparation of reports and bulletins for publication, identifying and labeling specimens, care of collections, cataloguing bird stomachs received, tabulating field reports, sorting and filing published matter valuable for reference, mapping distribution of birds and mammals, attention to the needs of field naturalists, developing photographic negatives and making prints therefrom, compiling game laws, issuing permits for the entry of foreign mammals and birds and for the export of trophies and specimens from Alaska, and cooperation in enforcing the various provisions of the act of Congress of May 25, 1900. The letters received during the year numbered about 6,000. Many of these contained information of value relating to economic subjects, and extracts from them have been filed for future use. The letters written during the same period numbered about 4,500, and 900 migration schedules were sent out to observers.

The collection of negatives made in the field for purposes of study

and illustration now number about 8,000. They form records of permanent value, which must increase as time goes on.

PUBLICATIONS.

The publications for the year include 1 number of North American Fauna, 3 bulletins, 5 circulars, 2 articles in the Yearbook, 2 Farmers' Bulletins, the report of the Chief for 1904, and 23 reprints of former publications.

North American Fauna, No. 24, by Wilfred H. Osgood, comprises "A biological reconnaissance of the base of the Alaska peninsula." The Farmers' Bulletins are: "The relation of coyotes to stock raising in the West" (No. 226), by D. E. Lantz, and "Game laws for 1904" (No. 207), by T. S. Palmer. The articles in the Yearbook are entitled "The relation of birds to fruit growing in California," by F. E. L. Beal, and "Benefits which the farmer may derive from game protection," by T. S. Palmer. Following are the titles of the circulars: No. 43, "Definitions of open and close seasons for game;" No. 44, "Directory of game officials;" No. 45, "Warning against trespass on the Breton Island Reservation;" No. 46, "Directions for collecting bird stomachs;" No. 47, "Recommendations of State game commissioners and wardens." The bulletins are entitled: No. 18, "Distribution and migration of North American warblers," by W. W. Cooke; No. 19, "Hunting licenses, their history, objects, and limitations," by T. S. Palmer; No. 20, "Coyotes in their economic relations," by D. E. Lantz. Reprints of the reports of the Chief for 1903 and 1904 were issued. The reprints of bulletins include the following: No. 6, "The common crow of the United States," by W. R. Barrows and E. A. Schwarz; No. 9, "Cuckoos and shrikes in their relation to agriculture," by F. E. L. Beal and Sylvester D. Judd; No. 10, "Life zones and crop zones of the United States," by C. Hart Merriam; No. 13, "Food of the bobolink, blackbirds, and grackles," by F. E. L. Beal; No. 15, "The relation of sparrows to agriculture," by Sylvester D. Judd; No. 17, "Birds of a Maryland farm," by Sylvester D. Judd. Twelve reprints of Yearbook articles are as follows: "How birds affect the orchard" (three issues); "Audubon societies in relation to the farmer;" "Birds as weed destroyers" (two issues); "Some new facts about the migration of birds;" "The food of nestling birds;" "Four vanishing game birds;" "The bluejay and its food;" "The meadow lark and Baltimore oriole;" "Four common birds of the farm and garden."

OUTLINE OF WORK FOR THE YEAR 1906.

GEOGRAPHIC DISTRIBUTION.

Field work in California, New Mexico, and Colorado will be continued during the year 1905–6 on much the same lines as in the past.

In Texas the field work for mapping faunal areas has been practically completed, and final reports are being prepared.

No field work in Alaska is contemplated before the spring of 1906, as the time of the assistant in charge of that work will be devoted to the elaboration of material already gathered.

The reconnaissance of the Mackenzie Basin has been completed, and a report upon the region is now nearly ready.

ECONOMIC ORNITHOLOGY AND MAMMALOGY.

A preliminary report on the relation of birds to the boll weevil in Texas, giving the results of observations in the field and of the examination of the stomachs of species supposed to feed upon the weevil, has been published. The work will be continued in cooperation with the Bureau of Entomology with a view to ascertain the part birds play in limiting the increase of this destructive insect.

Investigation of the food of California birds will be continued, and it is believed that the large amount of material now in hand will suffice for a very complete report upon the economic work of birds in a considerable portion of this important agricultural State.

One of our most valuable birds from an economic point of view is the rose-breasted grosbeak, which not only eats the Colorado potato beetle but apparently prefers this insect to all other food. A considerable number of stomachs of this bird and the allied species have been gathered, and they are now being examined with a view to the preparation of a bulletin on the subject.

During the past year experiments have been inaugurated to ascertain a practicable method of limiting, or altogether preventing, the damage to sheep by coyotes. So destructive are these animals in some sections of the West that the sheep industry has been abandoned as unprofitable. During the coming season the experiments will be continued, and it is believed that by means of wire fencing, at moderate cost, sheep may be safely inclosed, the services of herders largely dispensed with, and the quality of the pasturage greatly improved.

Further work will be done with a view to the discovery of means of preventing the damage to fruit trees by meadow mice, a most destructive group of small mammals whose ravages over much of the country are frequent and serious. So numerous are these little rodents in some regions that all ordinary means of destroying them by traps and poisons have proved inadequate, and it is thought that an effective virus may be discovered and the animals destroyed by inoculation. It is hoped to make experiments in this direction in cooperation with the Bureau of Animal Industry.

Much work has been already done with a view to the discovery of means of limiting the serious ravages of prairie dogs and ground squirrels. Further experiments will be tried, and it is hoped that a bulletin on the subject can be made ready for publication during the year.

Importations.—It is important that inspection service at ports of entry should be made more effective. There is a strong tendency to introduce exotic species, and constant vigilance is necessary to prevent the importation of such as may become pests. Birds and mammals liberated in a new country are likely to multiply beyond control, and often develop injurious traits not displayed in their native home. As soon as means are provided for the purpose, therefore, a more thorough system of inspection will be established so that the dangers that constantly threaten from this source may be reduced to a minimum.

Interstate commerce in game.—Field work will center largely in Kansas, North Carolina, and Virginia. The game law passed by Kansas this year makes cooperation with State authorities possible,

and investigation will be made of methods of game shipments, markets for such shipments, and the extent to which waterfowl are shipped in violation of the State law and the Lacey Act. Numerous violations of the Federal law have been reported to the Department from Virginia and North Carolina, and show the necessity for closer inspection in these States.

Information concerning game.—There is a growing need for prompt and extensive circulation of publications on laws and judicial decisions relating to game, owing to the increasing activity in enforcement and the heavier penalties imposed. Two hundred and ninety-five game cases were tried in the Illinois courts in the year ending June 30, 1904, and 351 in those of New Jersey in the year ending October 31, 1904. This rigid enforcement of the game laws makes it important that the law shall be known to all. In addition to the usual bulletins and posters containing a summary of the provisions of the game laws in force, a new edition of Bulletin 16 will be published, containing digests of the current laws. Work will be continued on the index of decisions on game laws, begun last year. This index will contain a brief résumé and syllabus of each case. It will comprise 200 of the most important decisions and will probably soon be ready for publication.

Special investigations.—Continuation of the preparation of the index of game laws undertaken in cooperation with the New York State Library will constitute a feature of the year's work. Investigation of the subject of private game preserves also will be continued. The increased number of these and the decrease of game in various localities have given impetus to the propagation of game for restocking purposes. Owing to the severity of recent winters the demand for quail far exceeded the available supply. A study will be made of the conditions under which game may be propagated successfully and in adequate quantity.

RECOMMENDATIONS.

In submitting estimates for the fiscal year 1907, the following recommendations are made:

(1) That an increase of $1,700 in the statutory roll be granted for the purpose of making the salary of the Chief conform more nearly to that of other Bureau heads, and of employing a stenographer and typewriter, whose services are necessary on account of the constantly increasing work of the Bureau.

(2) That an increase of $7,500 in the lump appropriation be granted to provide for the greatly increased demands for information and field work in locating the boundaries of the crop belts; for work on geographic distribution, economic ornithology and mammalogy, and game preservation, and for special investigations in connection with depredations of wolves on stock, and of rabbits, ground squirrels, and other injurious rodents on crops. A portion of the above sum, not to exceed $1,000, is desired for the payment of inspection fees for the entry of foreign birds and animals.